

REMARKS

This application is amended in a manner to place it in condition for allowance.

This amendment is filed with a Request for Continued Examination, and is intended to replace the previously filed amendment of April 27, 2009, which was denied entry according to the Advisory Action mailed May 12, 2009.

**Status of the Claims**

Claims 1-17 are amended as to form, and claim 3 is amended to clarify the claimed invention.

Claims 1, 19, 20 and 22 are amended substantively in a manner consistent with, for example, specification page 4, line 9, and 5, line 20 and the description of Figure 2.

Claims 1-7, 9-22 remain in this application.

**Claim Rejections-35 USC §112**

Claim 3 was rejected under 35 U.S.C. §112, second paragraph, for being indefinite. This rejection is respectfully traversed for the reasons below.

Claim 3 is amended to clarify the claimed invention in a manner consistent with the manner in which it was examined.

Therefore, withdrawal of the rejection is respectfully requested.

**Claim Rejections-35 USC §102**

Claims 1, 4-6, 9-11, 13-14, 16-17, 19 and 20, were rejected under 35 USC 102(b) as being anticipated by HABERMANN et al. ("HABERMANN"). This rejection is respectfully traversed for the reasons below.

Independent method claim 1, from which 4-6, 9-11, 13-14 and 16-17 depend, and independent device claims 19 and 20 recite: "the anode and cathode being separated by a porous, electronically non-conductive, non ion-selective partition wall". (Emphasis Added.)

The position of the Official Action was that HABERMANN discloses a "porous, electronically non-conductive, non-ion-selective partition wall that separates the cathode and the anode." However, as acknowledged by the Official Action, HABERMANN discloses a granulated slate solid electrolyte.

An "electrolyte" is an electric conductor by definition. See, the dictionary definition provided with the Amendment of October 16, 2008.

While HABERMANN discloses that non-conductivity may be embodied by the granulated slate electrolyte (page 132, left column 13<sup>th</sup> line from the bottom), the same cell must contain a conductive electrolyte (page 132, left column, 15<sup>th</sup> line from the bottom) that penetrates through the granulated slate. This electrolyte makes up the entire separator between the electrodes

conductive. That is, the anode and cathode of HABERMANN are separated by an electronically conductive wall.

Moreover, the granulated slate electrolyte with a particle size of 1-3 mm is not a compartmented partition wall as described in claim 1 which includes at least one anaerobic compartment and at least one aerobic compartment, which provide channels as described in claim 2.

Furthermore, the cell described by HABERMANN is fundamentally different than the claimed invention. HABERMANN is not a 'direct' bio fuel cell. Its operation is based on the biological reduction of sulfate to sulfide, which sulfide transfers electrons to an anode via a non-biological electrochemical process. HABERMANN requires special electrolytes (i.e., in the separator) for this transfer and for buffering the pH. The claimed invention, however, is made of specific micro-organisms that are capable of transferring the electrons directly to the anode (see page 2 line 23- page 3 line 11 of the present application). Accordingly, an extra oxidation-reduction cycle for the electron transfer is not necessary in a cell of the invention. Further, no buffer is needed as the pH is levelled out due to diffusion of H and OH<sup>-</sup> through the partition wall.

Therefore, HABERMANN fails to anticipate the claimed invention, and withdrawal of the rejection is respectfully requested.

**Claim Rejections-35 USC §103**

Claim 12 was rejected under 35 USC 103(a) as being unpatentable over HABERMANN in view of RICHTER et al. ("RICHTER"), and claim 15 was rejected under 35 USC 103(a) as being unpatentable over HABERMANN. These rejections are respectfully traversed for the reasons that follow.

HABERMANN was offered for the reasons discussed above.

Regardless of the ability of RICHTER to teach that for which it is offered, RICHTER fails to remedy the shortcomings of HABERMANN for reference purposes. RICHTER offers no suggestion for replacing the electronically conductive wall with a non-conductive wall.

Therefore, claims 12 and 15 are not rendered obvious, and withdrawal of these rejections is respectfully requested.

Claims 1-7, 9, 10, and 21 were rejected under 35 USC 103(a) as being unpatentable over KIM et al. EP 0827229 A2 ("KIM '229") in view of CHAO et al. US 4,581,105 ("CHAO"). This rejection is respectfully traversed for the reasons that follow.

The Official Action maintained that one would have been motivated to substitute the non-woven fiberglass separator of CHAO for the sintered glass separator of KIM '229.

However, CHAO is directed to electrochemical cells, and both KIM, as the claimed invention, relates to bio fuel cells.

CHAO acknowledges the functional difference between the cells by stating, "Although separators are not commonly used in electroplating cells or fuel cells, they are commonly present in batteries and electrosynthesis cells." (Emphasis added.) See, e.g., column 6, lines 4-7.

Thus, while CHAO may suggest that sintered glass and woven and non-woven fabrics made from fiberglass are equivalent separators for electrochemical cells, CHAO fails to recognize they are equivalent for the same intended purpose as KIM '229, i.e., bio fuel cells.

In order to rely on equivalence as a rationale supporting an obviousness rejection, the equivalency must be recognized in the prior art, and cannot be based on applicant's disclosure or the mere fact that the components at issue are functional or mechanical equivalents. *In re Ruff*, 256 F.2d 590, 118 USPQ 340 (CCPA 1958).

Thus, one of ordinary skill in the art would have been discouraged from making such a substitution, as there would be no expectation of success, considering the difference in the cells.

Moreover, the combination fails to suggest a preference for the separators as claimed.

As described in the present specification, the presence of biomass poses different requirements to the separators in view of problems such as clogging of the pores of the separator (See, e.g., page 6 of the present specification, lines 2-6).

However, CHAO along with the woven and non-woven fabrics made from fiberglass, includes porcelain and asbestos (column 6, lines 10-14) as separators. Applicants have identified important practical drawbacks have been found by these separators in particular (page 6, lines 2-4 of the present application). Thus, even if one were to combine CHAO with KIM '229 there is no suggestion that certain separators would provide improved results.

With respect to claim 2 specifically, the Official Action considered the bipolar configuration as a "duplication of parts". However, this is not the case, because the bipolar configuration is a direct way of stacking. That is, the cathode and the anode of different cells are connected to the bipolar plate along one or more their surface areas. In a traditional configuration, the cells are coupled via wires that are connected to a specific point on an electrode. This results in a higher internal resistance and thus a loss of capacity of the cell, because the electrons have to travel through the electrode to reach the point where the electric wire is connected (see also page 2, lines 14-17 of the present application). Thus, claim 2 is specifically considered unobvious.

Therefore, the combination does not render obvious the claimed invention defined in independent claims 1 and 21, as well as dependent claims 2-7 and 9-10, and withdrawal of the rejection is respectfully requested.

Claims 1-7, 9-10, 17 and 21 were rejected under 35 USC 103(a) as being unpatentable over KIM et al. WO 01/04061 A1 ("KIM '061") in view of CHAO et al. US 4,581,105 ("CHAO"). This rejection is respectfully traversed for the reasons that follow.

The Official Action maintained that one would have been motivated to substitute the non-woven fiberglass separator of CHAO for the sintered glass separator of KIM '061.

However, as discussed above, these separators are not art recognized equivalents for the same purpose, e.g., a bio fuel cell. That is, CHAO is directed to electrochemical cells, and CHAO recognizes that separators are not commonly used in fuel cells.

In order to rely on equivalence as a rationale supporting an obviousness rejection, the equivalency must be recognized in the prior art, and cannot be based on applicant's disclosure or the mere fact that the components at issue are functional or mechanical equivalents. *In re Ruff*, 256 F.2d 590, 118 USPQ 340 (CCPA 1958).

Thus, one of ordinary skill in the art would have been discouraged from making such a substitution, as there would be no expectation of success, considering the difference in the cells.

Moreover, the combination fails to suggest a preference for the separators as claimed, e.g., there is no teaching of anaerobic and aerobic compartments.

As described in the present specification, the presence of biomass poses different requirements to the separators in view of problems such as clogging of the pores of the separator (See, e.g., page 6 of the present specification, lines 2-6).

However, CHAO along with the woven and non-woven fabrics made from fiberglass, includes porcelain and asbestos (column 6, lines 10-14) as separators. Applicants have identified important practical drawbacks have been found by these separators in particular (page 6, lines 2-4 of the present application). Thus, even if one were to combine CHAO with KIM '229 there is no suggestion that certain separators would provide improved results.

With respect to claim 2 specifically, the Official Action considered the bipolar configuration as a "duplication of parts". However, this is not the case, because the bipolar configuration is a direct way of stacking. That is, the cathode and the anode of different cells are connected to the bipolar plate along one or more their surface areas. In a traditional configuration, the cells are coupled via wires that are connected to a specific point on an electrode. This results in a higher internal resistance and thus a loss of capacity of the cell, because the electrons have to travel through the electrode to reach the point where the electric wire is connected (see also page 2, lines 14-17 of the present application). Thus, claim 2 is specifically considered unobvious.



Therefore, the combination does not render obvious the claimed invention defined in independent claims 1 and 21, as well as dependent claims 2-7 and 9-10, and withdrawal of the rejection is respectfully requested.

Claims 11 and 14-16 were rejected under 35 USC 103(a) as being unpatentable over KIM '061 in view of CHAO , further in view of HABERMANN. This rejection is respectfully traversed for the reasons that follow.

KIM '061 and CHAO were offered for the reasons discussed above. However, HABERMANN cannot remedy the shortcomings of KIM '061 and CHAO for reference purposes. Indeed, as discussed above relative to the anticipation rejection HABERMANN is dissimilar to the claimed invention.

Therefore, withdrawal of the rejection is respectfully requested.

Claim 12 was rejected under 35 USC 103(a) as being unpatentable over KIM '061 in view of CHAO , further in view of RICHTER; claim 13 was rejected under 35 USC 103(a) as being unpatentable over KIM '061 in view of CHAO , further in view of HERTL et al. US 4,578,323 ("HERTL"); claim 18 was rejected under 35 USC 103(a) as being unpatentable over KIM '061 in view of CHAO , further in view of YAMAMOTO US 4,883,724 ("YAMAMOTO"); claim 22 was rejected under 35 USC 103(a) as being unpatentable over KIM

'061 in view of CHAO, further in view of YING et al. US 6,183,091 ("YING"). These rejections are respectfully traversed.

RICHTER, HERTYL, YAMAMOTO, and YING are each offered for teaching the features of 12, 13, 18 and 22. However, these documents fail to remedy the shortcomings of KIM '061 and CHAO for reference purposes, as discussed above.

Therefore, withdrawal of these rejections is respectfully requested.

### **Conclusion**

In view of the amendment to the claims and the foregoing remarks, this application is in condition for allowance at the time of the next Official Action. Allowance and passage to issue on that basis is respectfully requested.

Should there be any matters that need to be resolved in the present application, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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